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File - Test Section, Infantry Board

REPORT

of

The Infantry Board

No. 1608

PERFORMANCE OF GRENADE, RIFLE, FRAGMENTATION, M17

FORT BENNING, GEORGIA

11 May 1944

24725—Benning, Ga., 9-16-42—2,000

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471.6 (11 May 44)
GNRQT-11/83658

1st Ind.

HEADQUARTERS ARMY GROUND FORCES, Army War College, Washington, D. C.
28 May 1944

To: Commanding General, Army Service Forces, Attention: Research and Development Division, Room 4E 617, The Pentagon.

1. Herewith Infantry Board Report No. 1608 covering test of Grenade, Rifle, Fragmentation, M17.

2. Recommendation of the Commanding General, Army Ground Forces, previously furnished, limited the production of the T17 Grenade to 1,000,000 rounds and further recommended the increased production of the M9A1 Antitank Grenade because of its superiority as a general purpose rifle launched grenade.

3. The attached report substantiates the above recommendation and it is furnished as a matter of information only.

For the COMMANDING GENERAL:

(STAMPED) HERBERT L. NELSON
Lt. Col., A.G.D.
Asst. Ground Adj. Gen.

1 Incl.
w/d trip & quad cys

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11 MAY 1944

IB-471.6

SUBJECT: Performance of Grenade, Rifle, Fragmentation, M17.

TO: The Chief, Ground Requirements Section,
Army Ground Forces, Army War College,
Washington, D. C.

1. Authority and Purpose.

a. This is a performance study on anti-personnel rifle grenades, based upon extensive informative tests of the Grenade, Rifle, Fragmentation, M17. The tests were undertaken on the Board's own initiative.

b. The purpose of the present tests was to gather information on the following aspects of the subject grenade:

(1) Effectiveness of fragmentation.

(2) Reliability of functioning of the fuze.

(3) Ranges and accuracy.

(4) Technique of employment.

(5) Comparison with the Antitank Rifle Grenade, M9A1.

2. Description of Material. This grenade is merely the body of the standard Hand Fragmentation Grenade, Mark II, from which the bouchon has been removed and replaced with the fuze and tail assembly of the standard antitank rifle grenade M9A1. Since the threaded portion of the tail assembly does not fit the bouchon opening in the grenade body, a short connector-tube or adapter with the proper female and male threads to fit the tail assembly and body, respectively, joins the two. The fuze functions on impact only. Projection technique is identical with that for the antitank grenade. Owing to the greater weight of the body, as compared with that of the antitank grenade M9A1, its maximum range when launched from the same weapon is less, being about 225 yards when projected from the rifle and 128 yards from the carbine using only the basic propelling cartridge.

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Since it is contemplated that the Mark II fragmentation hand grenade is to be modified by substituting a bursting-charge consisting of two ounces of flake TNT with suitable detonator for the EC Powder, a small number of the subject grenades were modified in the same manner and used, along with the basic Mark II Grenade body during these tests.

3. Historical Background.

a. Rifle grenades of the period during and following World War I were of two types, as follows:

(1) The "V.B." rifle grenade with time fuze, launched from a mortar-like "tromblon" fitted on the rifle barrel, in which the time train was initiated by the action of a special wooden bullet as it passed through a longitudinal, central opening in the grenade.

(2) The standard hand-grenade body fitted with a rod extending into the bore of the rifle and a special fuze in which the time train was initiated by set-back as the grenade was launched.

b. Of the above grenades, the V.B. was found unsafe and unsatisfactory, and the rod type was abandoned as unnecessary for Infantry purposes when the 60mm mortar was adopted. Commencing about the year 1940, however, the need for some anti-personnel high-explosive projectile to cover the zone intermediate between the minimum range of the 60mm mortar (about 150 yards) and the maximum range of the hand-grenade (about 40 yards) was realized and various types of grenade throwers were designed, tested and rejected. On the advent of the anti-tank rifle grenade M9 and its successful utilization of the "spigot" principle of launching, Army Ground Forces (Infantry), in the summer of 1942 requested the development of a similar grenade with a fragmentation body and a sensitive impact fuze for use against hostile personnel. The subject grenade was developed in response to this request simultaneously with the Grenade Projection Adapter M1, and was, after brief and informal functioning tests at Aberdeen Proving Grounds in the presence of Infantry representatives, adopted for immediate production on a limited basis, to meet the urgent need of troops operating against the Japanese and to balance the extensive use by the enemy of the so-called "knee mortar".

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c. After initiation of this project, the original and unsatisfactory M9 antitank grenade was replaced by the present standard antitank grenade M9A1. Tests on the latter grenade showed that the functioning of its fuze and the unexpectedly good lateral fragmentation of the body gave good promise of achieving most of the results sought in the development of anti-personnel rifle-grenades, and the subject grenade, designated as Grenade, Rifle, Fragmentation, M17, was adopted as a stop-gap item only, and classified as "Substitute Standard."

4. Facts Shown by the Tests. The tests conducted by The Infantry Board, as recorded in detail in the appended "Report of Test" showed:

a. That the subject grenade functions reliably when falling on any type of ground except water and soft mud, both in high angle and flat trajectory fire. (Test No. 2)

b. That the accuracy of the subject grenade when launched at low angles was satisfactory for use against targets such as machine-gun nests and similar small-area targets, up to ranges of 100 yards. (Test No. 3)

c. That when used for high-angle fire, in the manner of a mortar, the subject grenade gave consistent results up to a range of 224 yards with the basic propelling cartridge in the rifle. (Test No. 5)

d. That the fragmentation (casualty producing effect) of the subject M17 grenade, with the old EC powder bursting charge is much less than that of the M9A1 antitank grenade; and when loaded with the present standard bursting charge for the Mark II Hand Grenade, of 2 ounces of flake TNT with detonator, its casualty producing effect is greater than that of the M9A1 antitank grenade. (Tests Nos. 7, 8, 9, 10 and 11)

5. Discussion: The results obtained in the tests indicated that the subject rifle-grenade represented a highly successful effort to produce a rifle grenade with effectiveness equal to that of the corresponding hand grenade at ranges more than five times as great as those possible with the hand grenade. It, with other equipment developed at the same time, constituted an effective counter to the much-discussed Japanese "knee mortar". When loaded with a high-

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explosive bursting charge, and when launched with or without the use of the auxiliary propelling cartridge M7, it can confidently be claimed to be the most effective rifle grenade in existence in any army.

However, it has a fairly close second in anti-personnel effect in the M9A1 Antitank Grenade, and the latter has the following advantages not possessed by the subject grenade:

(1) Longer range (nearly 400 yards).
(2) Effectiveness against heavy armor.
(3) Effectiveness against light overhead cover.

The presence of either grenade in the rifle platoon and squad places in the hands of the very front-line elements a means of neutralizing and destroying, by a concentration of high-explosive fire resembling that of artillery and mortars, such difficult obstacles as machine-gun emplacements with which ordinary small-arms fire cannot cope. It is debatable whether the extra deadliness against personnel in the open undoubtedly possessed by the subject grenade when TNT loaded, is of sufficient importance to outweigh the advantages found in the M9A1 grenade as mentioned above. It seems desirable to concentrate on one type of rifle grenade if it can reasonably be done without too much sacrifice in effectiveness. In the light of the above facts The Infantry Board is forced to the conclusion that there is no longer a sufficient military requirement in the Infantry for the Grenade, Rifle, Fragmentation, M17.

6. Conclusions. The Infantry Board concludes:

a. That the subject Grenade, Rifle, Fragmentation, M17, is superior in fragmentation effect against personnel in the open, but is inferior in all-around effectiveness, to the Grenade, Rifle, Antitank, M9A1.

b. That there no longer exists any military requirement for the subject grenade.

7. Recommendation: The Infantry Board recommends:

That production and issue of the subject Grenade, Rifle, Fragmentation, M17 be discontinued.

For the President:

INGOMAR M. OSETH,
Colonel, Infantry,
Director.

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TEST SECTION
THE INFANTRY BOARD
FORT BENNING, GEORGIA

13 DECEMBER 1943

SUBJECT: GRENADES FRAGMENTATION, IMPACT, M-17 (FORMERLY T-2)

TO: THE PRESIDENT, THE INFANTRY BOARD, FORT BENNING, GEORGIA

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I AUTHORITY AND REFERENCES

1. Authority: Letter, The Infantry Board, 29 June 1943, I.B. 471.6, Appendix "A".

2. References: T.C. 46 - 1943.

3. Introductory information:

a. The M-17 impact fragmentation rifle grenade is an anti-personnel grenade for use in conjunction with standard grenade launchers, grenade cartridges, caliber .30 rifles and carbine. The grenade is fired in a manner similar to the firing of the antitank grenade M9A1 (See F.M. 23-30) except for range determination. An impact type of fuze fires the grenade upon impact.

b. The grenade (see Plate I) consists of a serrated cast iron body to which is fitted a tail assembly made up of a stabilizer tube and a fin assembly. An impact fuze is located in the forward end of the stabilizer tube. The fuze is held in an unarmed position by a safety pin which fits in a hole through the fuze body and clamps about the stabilizer tube. The safety pin and fuze is identical to that of the M9A1.

The grenade is fired from the grenade launchers fitted to a Caliber .30 Rifle (M-1, 1903 or 1917) and the Carbine by using the standard grenade cartridges (M-3 and M-6). The safety pin must be removed before the grenade is fired. Upon impact, the fuze functions and detonates the grenade, providing the surface struck and the angle of impact are such as to exert pressure on the forward end of the grenade.

The range of the grenade will depend principally on the distance to which the stabilizer tube of the grenade is placed on the launcher.

II PURPOSE OF THE TEST

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4. Determine by firing tests the following:

a. Reliability of functioning on impact with various types of terrain to include sand, mud and water.

b. A range table for flat trajectory firing in degrees with the Carbine, M1903, M-1 and M1917 rifles and a diagram for using the sight leaf on the M1903 rifle.

c. A range table in degrees for high angle firing with the Carbine and the M-1 rifle and another according to positioning rings.

d. Fragmentation effect in comparison with the M9A1 and the Mk II grenades.

III DETAILS OF TESTS AND RESULTS

5. Test No. 1

a. Purpose: To determine the physical characteristics of the M-17 Fragmentation Rifle Grenade.

b. Method: By weighing, photographing and examination.

c. Results: See Plate I for photograph.

(1) Weights.

		Ounces
(a)	Complete round	26.08
	Body, ogive, and cone assembly	17.76
	Bursting charge	0.80
	Stabilizer	7.52
	Fuze assembly	0.16
		Inches
(b)	Length	9.09
	Body, ogive, and cone assembly	3.56
	Stabilizer assembly	6.13

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		Inches
(c)	Diameter (Max.)	2.25
	Stabilizer:	
	Outer	0.90
	Inner	0.85
(d)	Type of fuze	Impact

6. Test No. 2

a. Purpose: To determine the reliability of the M-17 rifle grenade in functioning on impact with various types of terrain including sand, mud and water.

b. Method: Subject grenades were fired into water, mud, sand and against harder ground in the following manner:

(1) Water: Using an angle of elevation of 65° or higher with the M-1 rifle and M-7 launcher grenades were fired with the ring seating of zero and with a No. 3 ring seating. Grenades were also fired from an elevation of 6 feet with zero ring seating so as to hit in the water approximately 20 yards from the launcher.

(2) Mud: Grenades were fired into the air at an angle of 45° so as to fall into soft mud covered with about 2 inches of water. The grenades were fired from the 1903 rifle with the M-1 launcher (ring seating No. 5).

(3) Sand: Grenades were fired into comparatively soft sand under the following conditions from the M-1 launcher and the 1903 rifle.

(a) Angle of elevation 45° No. 1 ring seating.

(b) Angle of elevation 45° No. 5 ring seating.

(c) Flat trajectory, zero ring seating. Eleven grenades were fired so as to land in sand at ranges varying from 30 to 60 yards from the firer.

(4) Firm Ground:

(a) 20 Grenades were fired from a height of 4 feet at a flat angle so as to strike approximately 30 and 50 yards from the firer.

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(b) 10 Grenades were fired at 45° elevation with a ring seating of 5 so as to land on firm turfed ground.

(5) Target Cloth: Grenades were fired at ranges of 25 and 50 yards against a 6' x 6' panel consisting of one layer of target cloth.

c. Results: Armed grenades were fired into water, mud, sand and against harder ground, with results as indicated below:

(1) Water: (a) Grenades were fired into the air at angles greater than 65 degrees so as to fall into water. They were fired from the M1 launcher with 3 rings showing and 0 rings showing. In no case did the grenades burst.

(b) Grenades were fired from a height of about 6' at a flat angle so as to hit the water about 30 yards from the firer. They were completely seated on the launcher. Grenades did not ricochet off the water surface and none burst.

(2) Mud: Grenades were fired into the air at a 45 degree angle so as to fall into soft mud covered with about two inches of water. They were fired from the M1 launcher with 5 rings showing. The grenades did not burst in this type of terrain.

(3) Sand: Grenades were fired into comparatively soft sand, under various conditions, from the M1 launcher on the M1903 rifle:

(a) Angle 45 degrees; positioning clip 1 ring showing (range about 165 yards): 5 grenades were fired and all burst.

(b) Angle 45 degrees; positioning clip 5 rings showing (range about 55 yards): 11 grenades were fired, with 9 bursts and 2 duds. It was noted that the grenades oscillated somewhat at this position and it is possible that those failing to burst did not strike exactly nose first. (See paragraph (c) below.)

(c) Flat trajectory; no rings showing; grenades fired so as to land in sand at ranges varying from 30 to 60 yards from the rifle; 11 grenades were fired, with 10 bursts and 1 dud. The grenade failing to burst first struck the ground on a slight reverse slope, then tumbled and bounced for about 50 yards.

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(4) Firm ground: (a) Grenades were fired from a height of about 4 feet at a flat angle so as to strike the ground about 30 yards from the firer. In 10 shots, 1 dud was encountered. Another grenade ricocheted and burst on subsequent impact.

(b) Other grenades were fired as above but struck at about 50 yards. Out of 10 shots, 1 dud occurred.

(c) To check the results described in Par. (3) (b) above, 10 grenades were fired under the same conditions (45 degrees and 5 rings showing) except that the grenades landed on fairly hard, turfed ground. There were no failures.

(d) In other high angle firing no failures have been encountered when the grenade struck ordinary firm ground.

(5) Target cloth: Grenades were fired at ranges of 25 and 50 yards against a 6' x 6' panel consisting of 1 layer of target cloth. A high percentage of detonations took place when the grenade struck the cloth panel.

7. Summary:

a. The grenade will give few or no malfunctions in high angle firing, when fired:

(1) So as to land on firm ground.

(2) So as to land in sand when fired with few or no rings showing on the launcher.

b. The grenade will give a small percentage of malfunctions when fired:

(1) Flat trajectory so as to strike sand or firm ground a short distance from the firer.

(2) High angle with a large number of rings showing on the launcher and so the grenade lands in sand or soft dirt.

c. The M-17 grenade will give a large percentage of malfunctions when fired:

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(1) Flat trajectory into mud and water.

(2) High angle into mud and water.

8. Test No. 3

a. Purpose: To determine range tables in degrees for flat trajectory firing by firing the M-17 fragmentation grenade with the Carbine, M1903, M1 and M1917 rifles.

b. Method: Each of the above mentioned rifles, except the 1917 which has the same characteristics as the 1903, were secured in a gun rest and fired at panels placed 25, 50, 75 and 100 yards away from the gun. Practice shots were fired until a good hit was registered on the panel, thereafter, a group of five grenades were fired at a predetermined point on the target. Before each shot, the Angle of Quadrant Elevation was measured and after each shot the angle of sight to the hits on the target were measured. The time interval was checked by the use of a stop watch. The Vertical and Horizontal dispersion was measured by establishing the origin of the panel as the upper left edge. All hits were measured from this point and later converted into a mean dispersion by establishing a zero for both the vertical and horizontal and measuring the deflection and elevation therefrom.

c. Results: With a constant depth seating of zero on the launcher, the following tables were computed:

(1) M-1 Rifle flat trajectory firing table:

Range Yards	Angle of Elevation Mils	Time Interval Seconds	Horizontal Dispersion Inches	Vertical Dispersion Inches
25	50	.5	18	9
50	99	1.2	21	9
75	175	1.9	47	9
100	239	2.24	21	25

(2) 1903 Rifle flat trajectory firing table. Note this same table can be used for 1917 rifle as both have the same ballistic characteristics.

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Range Yards	Angle of Elevation Mils	Time Interval Seconds	Horizontal Dispersion Inches	Vertical Dispersion Inches
25	47.4	.48	9	5
50	102.2	1.	20	13
75	160.6	1.50	45	32
100	213.0	2.24	45	25

(3) Carbine flat trajectory firing table:

Range Yards	Angle of Elevation Mils	Time Interval Seconds	Horizontal Dispersion Inches	Vertical Dispersion Inches
25	96.4	.96	12	7
50	190.	1.90	8	30
75	311.4	2.50	4	32
100	392.2	4.10	10	34

(4) For detailed results, see Appendix "p".

9. Test No. 4

a. Purpose: To make a diagram for flat trajectory firing to be used on the 1903 Rifle without the use of special sights.

b. Method: Panels were placed 25, 50, 75, and 100 yards away from a 1903 Rifle which was secured in a gun rest. Trial shots using the M-17 Grenade were fired at the panel until a hit was registered. Upon obtaining a hit in the center of the panel, a group of five grenades were then fired with the same elevation and direction. Without disturbing the lay of this gun an imaginary line was drawn from the center of the five shots through two prominent points of the rifle. Three confirmation shots were then fired for assurance.

c. Results: Firing disclosed that by setting the rear sight at 2350 and aiming through the peep sight over the top of the grenade, it is possible to hit a target at 25 yards. (See diagram on the following page.)

It was found that a line of aim passing over the top of the rear sight and over the top of the front sight will hit a target at 50 yards. (See diagram on following page.)

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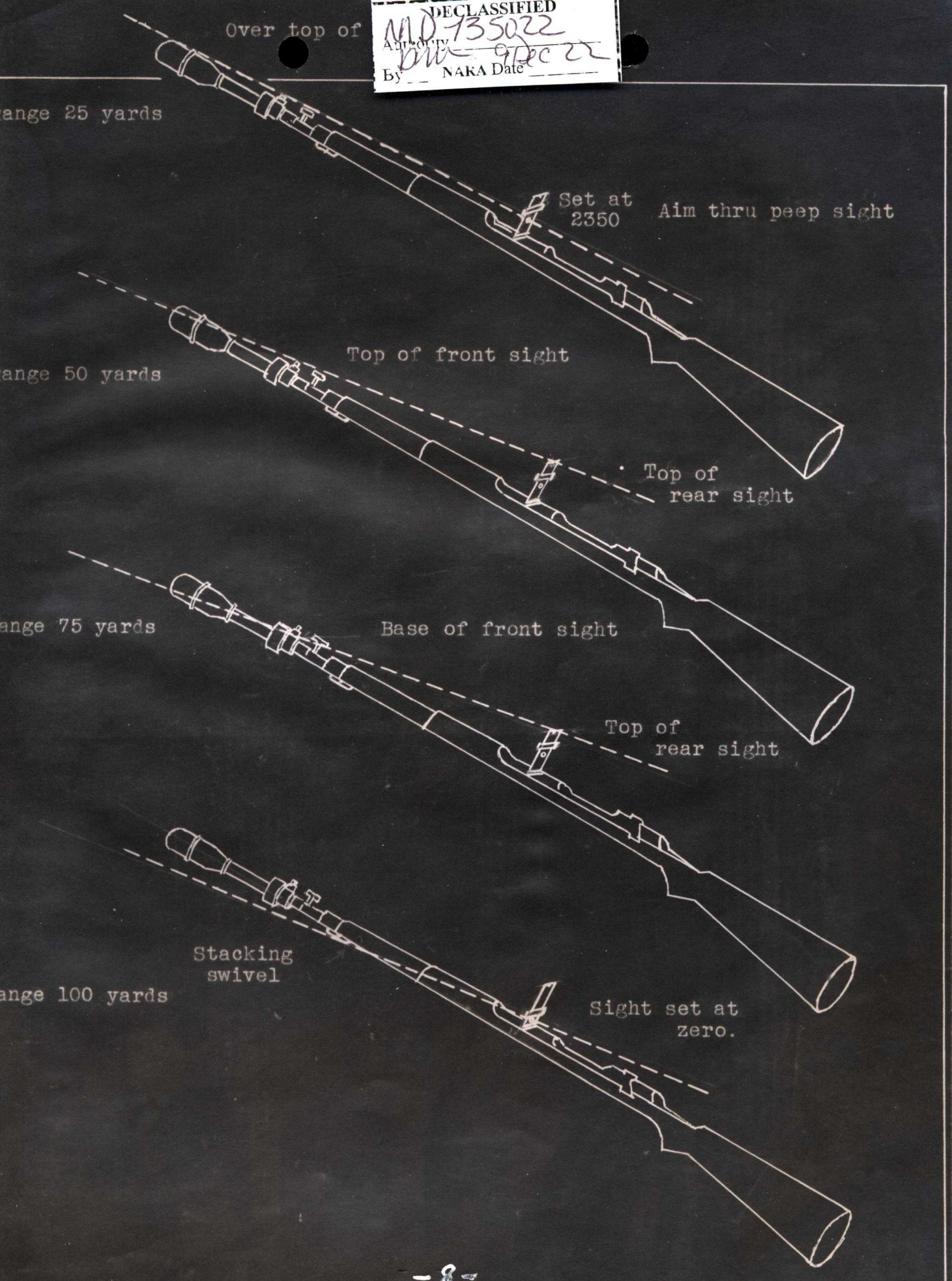

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The line of aim running over the top of the rear sight and through the base of the front sight is accurate in hitting targets at 75 yards. (See diagram on preceding page.)

By setting the rear sight at zero and aiming along the left side of the slide, using the left side of the stacking swivel in the rearmost position as a front sight, a target can be effectively engaged at 100 yards. (See diagram on preceding page.)

10. Test No. 5

a. Purpose: To determine by firing the M-17 fragmentation grenade a range table in degrees for high angle firing with the M-1 rifle and another table according to the positioning rings on the launcher.

b. Method: M-3 blank cartridges were used in the M-1 rifle with the M-7 launcher.

For each angle and grenade position on the launcher, a series of five shots were fired in one direction and another series in the opposite direction in order to cancel out wind effect as much as possible.

c. Results: Tabulated below is a summary of all firing:

(1) The results when firing at a constant angle with variable ring seatings are summarized below:

Angle Degrees	Ring	Range Yards
45	0	224
45	1	203
45	2	171
45	3	142
45	4	114
45	5	87
45	6	61

(2) The results when firing at variable angles with a constant depth seating of the grenade on the launcher are summarized as follows:

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Angle Degrees	Ring	Range Yards
45	0	224
40	0	217
35	0	207
30	0	194
25	0	176
20	0	150
15	0	121
10	0	84
5	0	52

(3) For results in detail see 1st Indorsement (IB-471.6 (9 Aug 43)) to Chief, Ground Requirements Section, Army Ground Forces, 11 Aug 1943.

11. Test No. 6

a. Purpose: To determine by firing the M-17 impact fragmentation grenade a range table in degrees for high angle firing with the Carbine and another table according to positioning rings on the launcher.

b. Method: The M-6 cartridges were used in the Carbine with the M-8 launcher.

For each angle and grenade position on the launcher, a series of five shots were fired in one direction and another series in the opposite direction in an effort to cancel out the wind effect as much as possible.

The distance of the burst from the launcher was measured for each shot and the averages computed. Deflection was also measured.

c. Results: Tabulated below is a summary of all firing.

(1) The results when firing at a constant angle with variable depth seatings of the grenade on the launcher are summarized below:

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Angle Degrees	Ring Setting Number	Range Yards
45	0	128
45	1	117
45	2	103
45	3	90
45	4	72
45	5	54
45	6	36

(2) The results when firing at variable angles with a constant depth seating of the grenade on the launcher are summarized below.

Angle Degrees	Ring Setting Number	Range yards
45	0	128
40	0	128
35	0	123
30	0	115
25	0	105
20	0	88
15	0	72
10	0	52
5	0	32

(3) For results in detail see 1st Indorsement (IB-063 (31 Aug 43)) to Chief, Ground Requirements Section, Army Ground Forces, 20 September 1943.

12. Test No. 7

a. Purpose: To determine the fragmentation effect of the M-17 Rifle Fragmentation Grenade.

b. Method: Ten (10) M-17 Grenades were dropped from a scaffold. (See following diagram)

In 120° arcs around the center of impact, panels 5-1/2 feet high and 10 feet wide made from one inch pine boards were placed at

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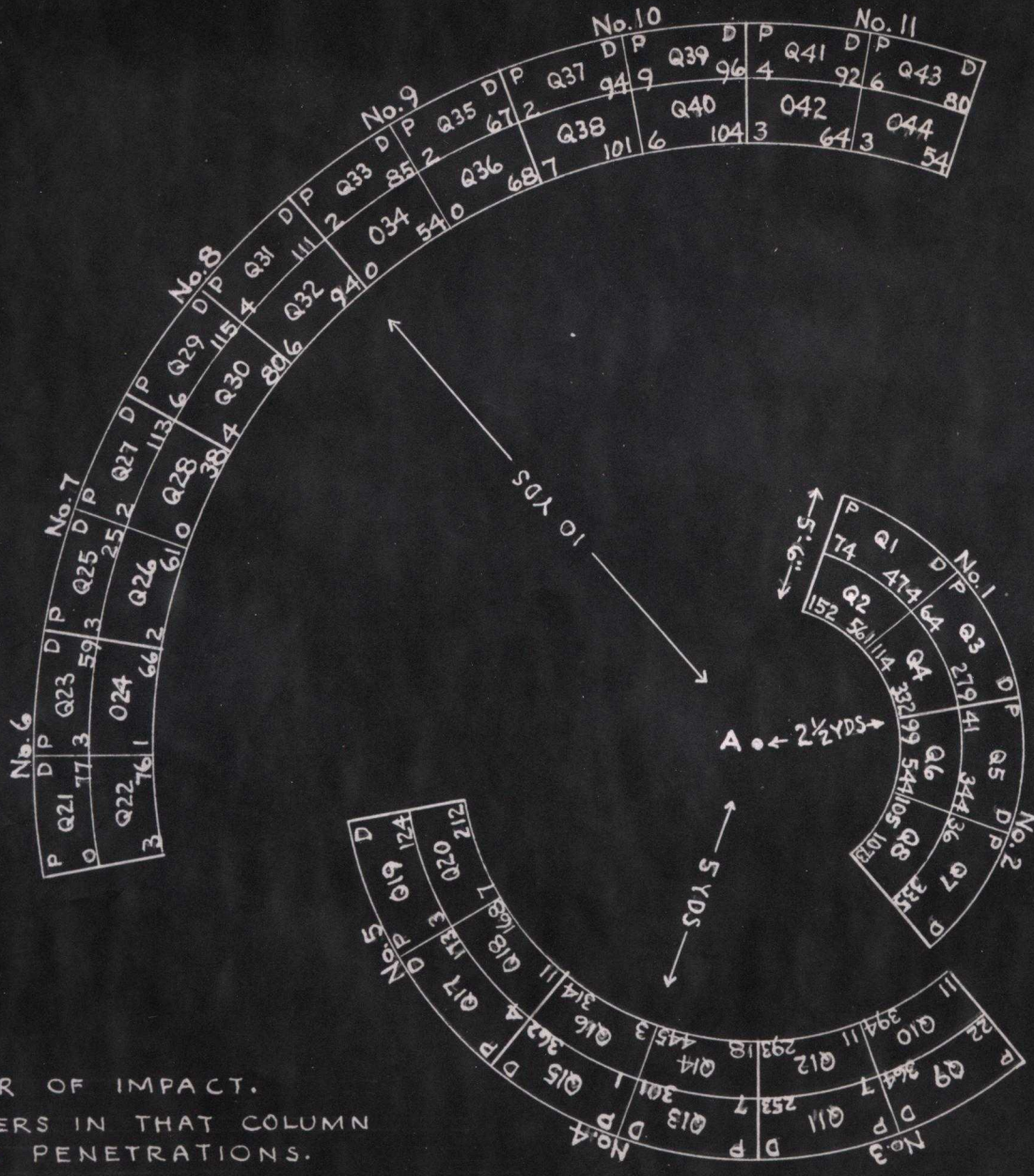

A = CENTER OF IMPACT.

P = NUMBERS IN THAT COLUMN SHOW PENETRATIONS.

D = NUMBERS IN THAT COLUMN SHOW DENTS.

M9, A-1 Grenade

Diagram showing arrangement of Panels about the Point of Impact

Panels made from 1" pine boards.

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2-1/2, 5 and 10 yards. The panels were divided into quadrants and numbered as shown on the diagram. The penetrations and dents were recorded after each shot. To obtain the correct number of penetrations and dents for 360°, the figure obtained from each arc of 120° at the different ranges was multiplied by three.

c. Results:

(1) At 2-1/2 yards from the center of impact for ten (10) shots the:

Total Penetrations were	348
Total Dents were	4473
Average Penetrations Per Shot	34.8

(2) At 5 yards from the center of impact for ten shots the:

Total Penetrations were	120
Total Dents were	1479
Average Penetrations Per Shot	12
Average Dents Per Shot	147.9

(3) At ten (10) yards from the center of impact for ten (10) shots the:

Total Penetrations were	92
Total Dents were	750
Average Penetrations Per Shot	9.2
Average Dents Per Shot	75

13. Test No. 8

a. Purpose: To determine the fragmentation effect of the M9A1 Antitank Rifle Grenade.

b. Method: Ten (10) M9A1 Grenades were dropped from a scaffold (see following diagram). In arcs of 120°, one inch pine board panels measuring 5' 6" high were placed around the point of impact at 2-1/2, 5 and 10 yards. These panels were divided into 4 quadrants as shown on the diagram. The penetrations and dents were recorded after each shot. To obtain the correct number of penetrations and dents for a complete circle at each range, the figures for the 120° arcs were multiplied by three (3).

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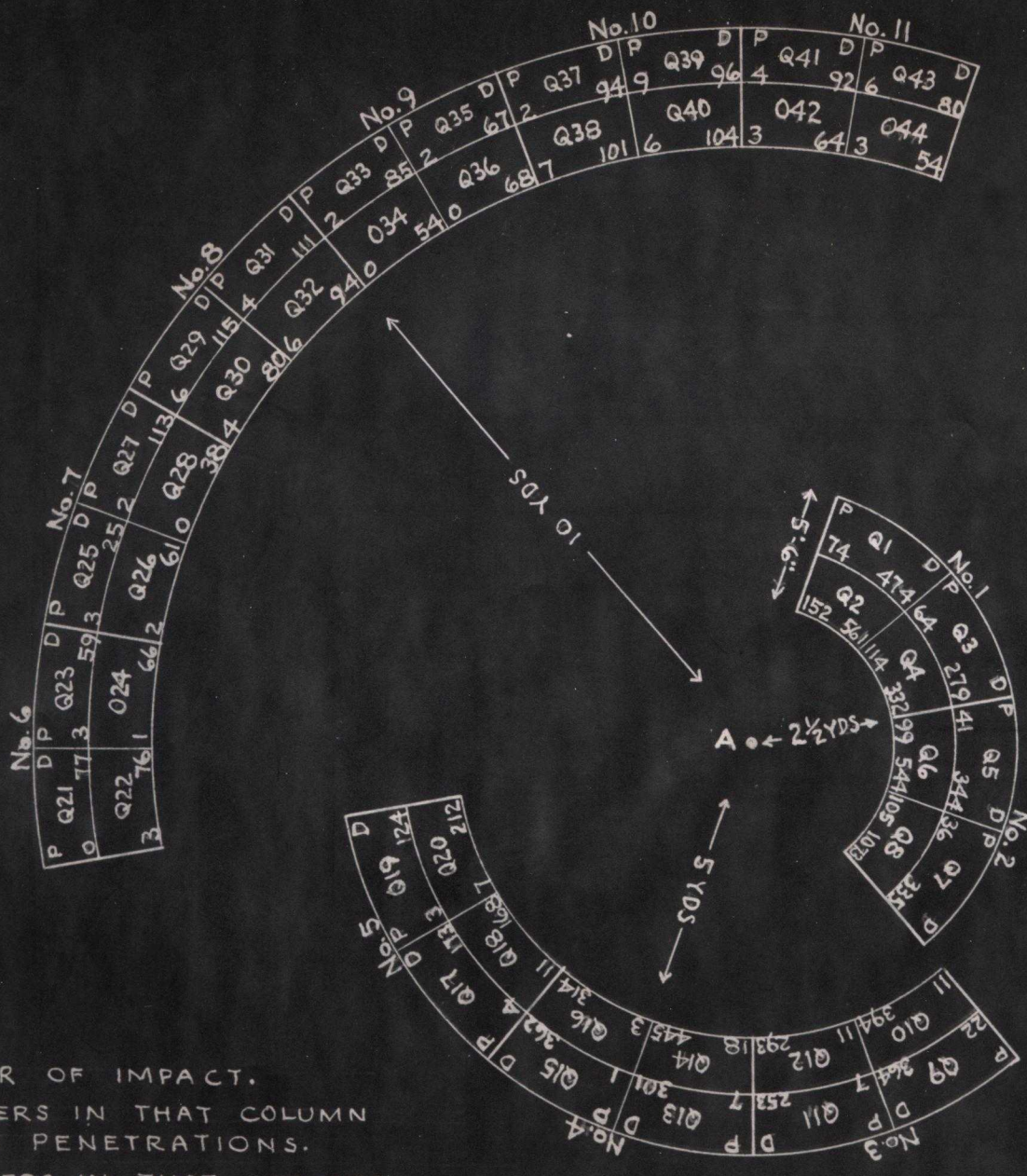

A = CENTER OF IMPACT.

P = NUMBERS IN THAT COLUMN SHOW PENETRATIONS.

D = NUMBERS IN THAT COLUMN SHOW DENTS.

M9, A-1 Grenade

Diagram showing arrangement of Panels about the Point of Impact

Panels made from 1" pine boards.

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c. Results: (For detailed results see Appendix "B".)

(1) The panels at 2-1/2 yards showed:

Total number of Penetrations for 10 shots	2055
Total number of Dents for 10 shots	11826
Average penetrations per shot	205.5
Average dents per shot	1182.6

(2) The panels at 5 yards showed:

Total number of penetrations for 10 shots	315
Total number of dents for 10 shots	10209
Average penetrations per shot	31.5
Average dents per shot	1020.9

(3) The panels at 10 yards showed:

Total number of penetrations for 10 shots	234
Total number of dents for 10 shots	5802
Average penetrations per shot	23.4
Average dents per shot	508.2

14. Test No. 9

a. Purpose: To determine the fragmentation effect of the Mark II Grenade.

b. Method: Five Mark II Fragmentation Grenades were exploded in a vertical position from the center of an area divided off in three arcs of 120°. In each 120° section there were constructed panels 5-1/2 feet high. The panels were divided into quadrants and numbered as shown in the diagram, page 14. The penetrations and dents were recorded after each shot. To obtain the correct number of penetrations and dents for 360°, the figure obtained from each 120° arc at the different radii were multiplied by 3.

c. Results:

(1) At 2-1/2 yards from the center of impact for five shots the:

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Total Penetrations	60
Total Dents	204
Average Penetrations Per Shot	12
Average Dents Per Shot	40.8

(2) At 5 yards from the center of impact for five shots:

Total Penetrations	57
Total Dents	69
Average Penetrations Per Shot	11.4
Average Dents Per Shot	13.8

(3) At 10 yards from the center of impact for five shots:

Total Penetrations	63
Total Dents	81
Average Penetrations Per Shot	12.6
Average Dents Per Shot	16.2

15. Test No. 10

a. Purpose: To compare the fragmentation effect of the M-17 Rifle Grenade with the M9A1, M-17 with No. 8 Blasting Cap and the M-17 Grenade with No. 8 Blasting Cap plus 2 oz. of T.N.T.

b. Method: By comparison of results obtained in fragmentation tests conducted in:

(1) Test No. 7, Par. 11, this report (For M-17 Grenade).

(2) Test No. 8, Par. 12, this report (For M9A1 Grenade).

(3) Test No. 2, Par. 5, IB Report No. 1547 (For M-17 Grenade) with No. 8 Blasting Cap and with No. 8 Blasting Cap plus 2 oz. of T.N.T.

c. Results: Tabulated below is a comparison of the fragmentation effect of the following grenades:

(1) M-17.

(2) M-17 Grenade with No. 8 Blasting Cap.

(3) M-17 Grenade with No. 8 Blasting Cap loaded with 2 oz. of T.N.T.

(4) M9A1 (Antitank)Grenade.

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	M-17 Grenade	M-17 Grenade with No. 8 Blasting Cap See Foot-Note*	M-17 Grenade with No. 8 Blasting Cap loaded with 2 oz. T.N.T. See Foot-note*	M9A1 (Anti-tank) Grenade
Total Number of Grenades Fired	10			10
At a radius of 2-1/2 yards from the center of impact:				
The average number of penetrations per shot	35	119.4	423	206
At a radius of 5 yards from the center of impact:				
The average number of penetrations per shot	12	31.4	115.2	32
At a radius of 10 yards from center of impact:				
The average number of penetrations per shot	9	21	42	23

*Footnote: Derived from comparison of data in Infantry Board Report No. 1547 Par. 5, c.

16. Test No. 11

Wind: None
Temperature: Min. 62 - Max. 81.
Date: Nov. 2, 1943

a. Purpose: To determine by comparison with the M9A1 Grenade the fragmentation effect of the M-17 Grenade fired into a group of panels.

b. Method: One M-17 Grenade was fired 200 yards from a panel area with an elevation of 40°. The Panel Area consisted of two kneeling

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type silhouettes which were placed at right angles to each other and placed every 2-1/2 yards making a 50-yard square area. The point of impact was plotted and all panels were examined to obtain the number of hits. This test was repeated with the M9A1 grenade.

c. Results: (See following page for diagram.)

(1) M-17 Grenade.

(a) The point of impact was in the center of the area and the hits on the targets were as follows:

(b) Within a 5-yard radius ten out of nineteen panels were hit, thus securing hits on 52% of the targets within the 5-yard radius.

(c) The grenade hit one panel which was practically demolished. The number of hits on this target were 123.

(d) Within a radius of 10 yards, 18 hits were made on 56 panels. Thirty-two per cent of the targets within this radius were hit.

(e) The greatest number of panels hit were laterally and to the rear. See diagram on Page 20.

(2) The M9A1 grenade point of impact hit a panel which was completely demolished. However, 147 hits were counted on this panel as well as the following:

(a) Within a radius of 5 yards from the point of impact 8 panels were hit out of 15 or a total of 53%.

(b) Within a radius of 10 yards, 16 panels were hit out of 55 or a total of 30%.

3. By comparison the percentage of panels hit for the M-17 and M9A1 are tabulated below.

Within a five-yard radius:

M-17 - 52% of panels hit.
M9A1 - 53% of panels hit.

Within a 10-yard radius:

M-17 - 32% of panels hit.
M9A1 - 30% of panels hit.

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IV SUMMARY OF FACTS DETERMINED BY TESTS

17. The complete M-17 rifle grenade weighs 26.07 oz. Par. 5 c.

18. The length of the complete round is 9-5/8 in. Par. 5 c.

19. The M-17 grenade will give few or no malfunctions in high angle firing when fired: (Par. 6 c (3).)

a. So as to land on firm ground.

b. So as to land in sand when fired with few or no rings showing on the launcher.

20. The grenade will give a small percentage of malfunctions when fired: (Par. 6 c (3).)

a. Flat trajectory so as to strike sand or firm ground a short distance from the firer.

b. High angles with a large number of rings showing on the launcher and so the grenade lands in the sand or soft dirt.

21. The subject grenade will give a large percentage of malfunctions when fired: (Par. 6 c (3).)

a. Flat trajectory into mud and water.

b. High angle into mud and water.

22. With a constant zero depth seating of the grenade on the launcher range tables for flat trajectory firing with the carbine, M1903, M1917 and M1 rifle are found in Par. 8. c.

23. A diagram for flat trajectory firing to be used on the 1903 rifle without the use of special sights is found in Par. 9. c. Page 8.

24. A high angle firing range table in degrees for firing the M-17 grenade with the M-1 rifle is found in Par. 10 c.

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25. A high angle firing range table in degrees for firing the M-17 Grenade with the Carbine is found in Par. 11, c.

26. A summary of the fragmentation effect of the M-17 Grenade is as follows: Par. 12 c.

The average penetrations per shot

Within a 2-1/2 yard radius	35
Within a 5 yard radius	12
Within a 10 yard radius	9

27. A summary of the fragmentation effect of a M9A1 Grenade is as follows: Par. 13 c.

The average penetrations per shot

Within a 2-1/2 yard radius	206
Within a 5 yard radius	32
Within a 10 yard radius	23

28. A summary of the fragmentation effect of the Mark II Grenade is as follows: Par. 13 c.

Within 2-1/2 yards	12
Within 5 yards	11
Within 10 yards	13

29. A comparison of the fragmentation effect of the M-17 Grenade to the M9A1, the M-17 with a No. 8 Blasting Cap and the M-17 with the No. 8 Blasting Cap loaded with 2 oz. of T.N.T. is as follows: Par. 15 C.

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	M-17 Grenade	M-17 Grenade with T-1 Fuze See Footnote*	M-17 Grenade with T-1 Fuze loaded with 2 oz. of T.N.T. See Footnote*	M9A1 (Anti-tank Grenade
Total Number of Grenades Fired	10			10
At a radius of 2-1/2 yards from the center of impact:				
The average number of penetrations per shot	35	119.4	423	206
At a radius of 5 yards from the center of impact:				
The average number of penetrations	12	31.4	115.2	32
At a radius of 10 yards from the center of impact:				
The average number of penetrations per shot	9	21	42	23

*Footnote: Derived from comparison of data in I.B. Report No. 1547 Par. 5 c.

30. By firing into a panel area the comparative fragmentation effect of the M-17 grenade to the M9A1 is as follows:

Within a five-yard radius	Within a ten-yard radius
M-17 52% of panels hit	M-17 32% of panels hit
M9A1 53% of panels hit	M9A1 30% of panels hit

I concur in the above report:

JOHN C. BRINSMEAD,
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Test Officer.

WILLIAM C. RUTHERFORD,
Lt. Colonel, Infantry,
Chief of Test Section.